



George C. Marshall Space Flight Center  
Marshall Space Flight Center, Alabama 35812

**ED27-CDL-FOP-006**  
**BASELINE**  
**AUGUST 13, 1999**

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**FACILITY OPERATING PROCEDURE**

**ED27 / STRUCTURAL AND DYNAMICS**  
**TESTING GROUP**

**KEITHLEY 500A DATA ACQUISITION**  
**SYSTEM CALIBRATION AND**  
**SOFTWARE VERIFICATION**  
**USING AMM2 AND AIM3A**  
**INTERFACE CARDS**

**CHECK THE MASTER LIST—**  
**VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE**

ED27 / Structural and Dynamics Testing Group		
KEITHLEY 500A DATA ACQUISITION SYSTEM CALIBRATION AND SOFTWARE VERIFICATION USING THE AMM2 AND AIM3A INTERFACE CARDS	ED27-CDL-FOP-006	Revision: BASELINE
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## DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		08/13/99	Document converted from ED73-CDL-FOP-006. Organizational and reference document numbers changes was made to the document. Also added was an additional reference to Keithley DAC- 500 Measurement and Control System Manual in section 4.12 for additional hardware adjustments.

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## 1. INTRODUCTION

1.1 Scope. This procedure provides instructions to calibrate and verify the Keithley 500A Data Acquisition System software used in the Control Dynamics Laboratory at the Marshall Space Flight Center.

1.2 Purpose. This document defines calibration procedures as required by MPG 8730.5

1.3 Applicability. This procedure applies to the Keithley 500A with VIEWDAC software used in the performance of dynamic and controls testing within the Modal and Control Dynamics Team (ED27).

## 2. DOCUMENTS

### 2.1 APPLICABLE DOCUMENTS

ED27-CDL-SOP-002 Control of Quality Records in the Control Dynamics Laboratory

### 2.2 REFERENCE DOCUMENTS

Associated Equipment Manuals

Keithley DAC 500-Series Measurement and Control Systems Manual

Keithley ASYST VIEWDAC Reference Manual

MPG 8730.5 Control of Inspection, Measuring and Test Equipment

ED27-CDL-FOP-005 Data Acquisition Using Keithley 500A with VIEWDAC

ED27-CDL-FOP-004 Cabling Schematic for the Keithley 500A Data Acquisition System using the AMM2 and AIM3A Interface Cards

## 3. DEFINITIONS

3.1 Sequence A sequence is a collection of tasks and front panels. A sequence can be thought of as a program, with the tasks analogous to subroutines. Sequences are edited and displayed through sequence windows.

3.2 Task A task is a sequence building block. Task are used to perform specific jobs; for example, an analog input task is used to acquire data and a numeric display task is used to display data.

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3.3 Front-Panel A Front-Panel is a window associated with a sequence. All sequences create a front panel by default. The front panel allows the user to view and/or modify tasks while they are running.

3.4 AMM2 The AMM2 is the Master Analog Measurement Module which functions as a standard analog input module, selects and conditions analog signals from other analog input modules, and serves as a 16-bit A/D converter for all input channels. The AMM2 can accept 16 single-ended or 8 differential analog inputs.

3.5 AIM3A The AIM3A is a Analog Input Module which accepts 32 single-ended or 16 differential analog inputs.

#### 4. INSTRUCTIONS

The following calibration and verification procedures will be done before each test, after a software/hardware upgrade or system repair. Results will be noted and filed as defined in ED27-CDL-SOP-002. Any out-of tolerances will be adjusted or repaired before use and the procedure will be redone.

4.1 Set-up an analog data acquisition sequence to display and measure the peak amplitude of a 1.0 volt peak sine signal at 50 Hz in channel 1 of AIM3A.

4.2 Measure the moving average of 50 peak values while simultaneously measuring the peak value using a calibrate digital multimeter or scope.

4.3 Calculate the difference between the value obtained from the Keithley AIM3A and the value obtained from the calibrated digital multimeter. Note the difference or offset value on the Calibration sheet.

4.4 Calculate the percentage difference between the value obtained from the Keithley AIM3A and the value obtained from the calibrated digital multimeter or scope. Note the value on the Calibration sheet.

4.5 Set-up an analog data acquisition sequence to display and measure the peak amplitude of a 1.0 volt peak sine signal at 100 Hz in channel 1 of AIM3A.

4.6 Measure the moving average of 50 peak values while simultaneously measuring the peak value using a calibrate digital multimeter or scope.

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- 4.7 Calculate the difference between the value obtained from the Keithley AIM3A and the value obtained from the calibrated digital multimeter. Note the difference or offset value on the Calibration sheet.
- 4.8 Calculate the percentage difference between the value obtained from the Keithley AIM3A and the value obtained from the calibrated digital multimeter or scope. Note the value on the Calibration sheet.
- 4.9 Calculate the average value of the offset values obtained and note the value on the Calibration Sheet and the Test Set-Up sheet.
- 4.10 To compensate for the difference between the calibrated value and the value measured by the Keithley 500A, insert the average offset values in the channel offset column for each corresponding channel. Then save the test sequence file and repeat the last measurement to verify that the calibrated value and the value measured by the Keithley AIM3A are equal.
- 4.11 Repeat steps 4.2 through 4.11 for each data acquisition channel that will be used during testing.
- 4.12 If the difference between the calibrated voltage meter and the measured AIM3A voltage values are greater than +/- 5%, follow the instructions in the Keithley DAC 500-Series Measurement and Control Systems Manual to adjust hardware settings. Then Repeat steps 4.2 through 4.12 again.

## 5.0 QUALITY RECORDS

- 5.1 The Test Set-Up sheet. The Test Set-Up sheet shown in the appendix should be filled out for every test.
- 5.2 The Calibration sheet in the appendix should be filled out for each calibration.

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## APPENDIX A

### KEITHLEY 500A CALIBRATION SHEET

CALIBRATION PERFORMED BY:\_\_\_\_\_ CALIBRATION DATE:\_\_\_\_\_

MEASUREMENT DEVICE):\_\_\_\_\_

BRAND & MODEL:\_\_\_\_\_ S/N:\_\_\_\_\_

AIM3A S/N:\_\_\_\_\_

TEST SEQ NAME:\_\_\_\_\_

CH#	FREQUENCY	CALIBRATED	AIM3A	OFFSET	AVERAGE	% DIFFERENCE
	(HZ)	VOLTMETER(V)	VOLTAGE(V)	VOLTAGE (V)	OFFSET(V)	OFFSET(V)
1	50				-	-
1	100					
2	50				-	-
2	100					
3	50				-	-
3	100					
4	50				-	-
4	100					
5	50				-	-
5	100					
6	50				-	-
6	100					
7	50				-	-
7	100					
8	50				-	-
8	100					
9	50				-	-
9	100					
10	50				-	-
10	100					
11	50				-	-
11	100					
12	50				-	-
12	100					

REMARKS:

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## VIEWDAC/KEITHLEY 500A TEST SETUP SHEET

TEST ID: \_\_\_\_\_ DATE: \_\_\_\_\_

TASK NAME: \_\_\_\_\_ DAS DEVICE: \_\_\_\_\_

FILENAME: \_\_\_\_\_

START CHANNEL: \_\_\_\_\_ NO. OF SCANS: \_\_\_\_\_

NO. OF CHANNELS: \_\_\_\_\_ SCAN RATE: \_\_\_\_\_

CH#	DATA NAME	RANGE	SLOPE	OFFSET	UNITS

APPROVED: \_\_\_\_\_ APPROVED: \_\_\_\_\_  
DYNAMICS ENGINEER TEST ENGINEER(ED27)

CONCURRENCE: \_\_\_\_\_  
R&QA REPRESENTATIVE

REMARKS: